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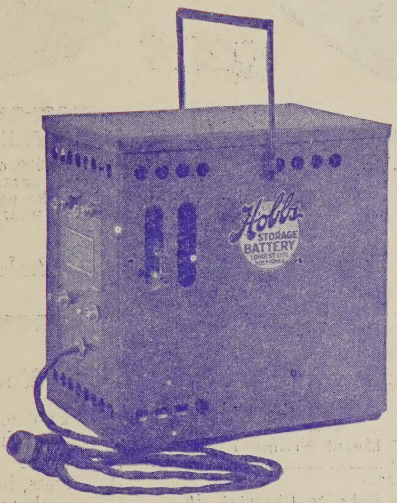

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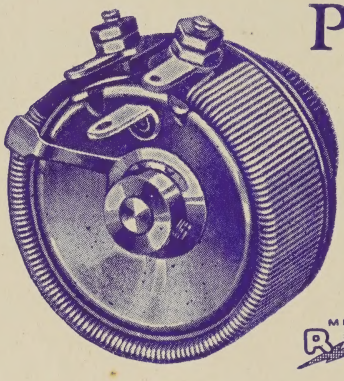

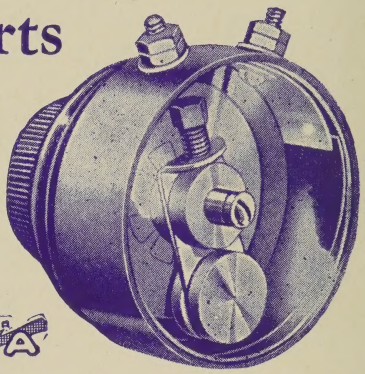

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FOREWORD

E. M. Sargent announced his revolutionary Infradyne in the August issue of "RADIO," published in San Francisco. The announcement met with instant response. Radio enthusiasts everywhere welcomed the news that the ultimate in radio had been attained. Thousands of Infradyne receivers are already in use—and the circuit is only two months old. Gratifying reports from enthusiastic owners tell of almost unbelievable results. Australia, Chicago, Kansas City and Pittsburgh have all been heard on the Pacific Coast. The purpose of this Manual is to simplify the problem of constructing and operating the Infradyne. If the instructions contained herein are carefully followed the builder should have no difficulty in receiving stations 2000 miles distant with loud speaker volume. Those who have already built the Infradyne are advised to make the last-minute improvements to the circuit as announced by E. M. Sargent in this manual. The Infradyne is more selective, is quieter in operation and brings in the extreme long distance stations better than any other circuit used by the inventor during his 15 years' experience in radio construction. Truly, it is a revelation. The receiver you have long waited for is here.

INFRA-DYNE

Radio's Greatest Development

HOW THE IMPROVED INFRADYNE

1 - It uses a new method for controlling the filament voltage of the oscillator tube. The Amperite control for this tube is eliminated.

2 - A single ballast resistor controls the filaments of the detector and two audio amplifier tubes, eliminating the three individual Amperites.

3 - A single ballast resistor controls the filaments of both r.f. tubes, eliminating the 10 ohm rheostat.

THE NEW SARGENT

By E. M.

ACTUAL experience in constructing the infradyne circuit, garnered from questions asked by thousands who have built the set in accordance with the directions first published in August, 1926 RADIO, is the basis for the revised circuit here presented. To distinguish it from the original and to give due credit to Mr. L. C. Rayment for his part in developing the circuit during the two years of research of which it is the product, the new model is called the Sargent-Rayment infradyne.

The infradyne is a distinctly new development and is in no sense a superheterodyne. Both use an oscillator in combination with the incoming wave, as also some other types of sets. But otherwise it is fundamentally different in operation and in characteristics.

The complete set is essentially a standard five-tube tuned radio frequency unit to which is added an oscillator tube, a mixer tube and a three stage infradyne amplifier unit. This last unit is tuned to give maximum amplification at a constant frequency of 3,490,000 cycles, or 86 meters. This frequency is equal to the sum of the incoming signal's frequency and the oscillator frequency, this summation being made in the mixer tube. For instance if the incoming frequency is 1,000,000 cycles, roughly corresponding to 300 meters, the oscillator is set to generate 2,490,000 cycles so as to give a sum of 3,490,000 cycles. Or if the incoming frequency is 750,000 cycles, corresponding to 400 meters, the oscillator is set to generate 2,740,000 cycles, so as to give the require constant sum. The sum frequency is detected and then amplified through two stages as in any other standard circuit.

The advantages in the use of the sum frequency include the fact that each station can be heard at but one setting of the wavelength condenser and of the os-

DIFFERS *from the* ORIGINAL MODEL

4 - "Trimmer" or vernier condensers are shunted across the banks of the three gang condenser, resulting in extreme selectivity.

5 - The 500,000 ohm variable resistance is replaced by a 200,000 ohm resistance and this is now used to control the plate circuit of the r.f. amplifier.

6 - A 50,000 ohm Frost No. 886 volume control is shunted across the mixer tube. This is used to regulate volume.

RAYMENT INFRADYNE

Sargent

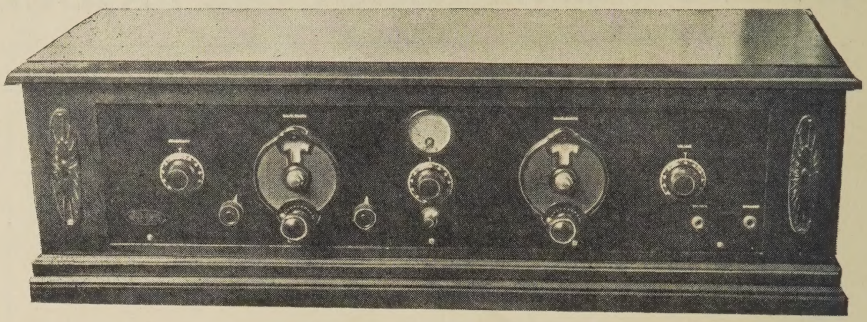
cillator condenser. Furthermore reception is quieter because circuits tuned to 86 meters will not pick up interference from long wave commercial transmitters nor can microphonic tube noises and other audio frequency currents generated in the tuned r. f. stages or in the mixer tube pass through the infradyne amplifier unit.

The infradyne does not radiate energy into the antenna and thus does not annoy your neighbor with squeals and howls. Due to its design it is extremely selective, more so than any other type of commercial receiver. With what virtually amounts to six stages of tuned radio frequency amplification it is very sensitive, picking up the most distant stations. Although the infradyne amplifier unit is so sharply tuned that its peak or resonance point is less than one meter wide, that represents a 20 kilocyle band at the high frequency employed, so that no distortion is introduced in the r. f. amplification and with good audio transformers perfect tone quality is attained.

The detailed method of constructing the Sargent-Rayment infradyne is obvious from the pictures and diagrams. The changes shown in the pictures of the front and rear views, in the schematic and pictorial wiring diagrams, and in the panel and baseboard layouts are summarized in the following paragraphs:

1—**The 6V199 Amperite which controls the oscillator tube is removed from the baseboard. The filament control for the oscillator tube is now made by the same rheostat which controls the filaments on the infradyne amplifier unit. In other words, all four "99" tubes are controlled from the rheostat directly below the voltmeter. This assures better control of the oscillator tube voltage.**

2—**A Cardwell or Hammarlund three-gang variable condenser is used in the radio frequency circuit and "trimmer," or small vernier condensers are shunted across the gangs for finer tuning.**



Front View of Sargent-Rayment Infradyne

3—The 500,000 ohm variable resistance is removed from the panel of the original model. In its place a 200,000 ohm variable resistance is installed. This 200,000 ohm variable resistance controls the plate circuit of the tuned r. f. amplifier.

4—The 10-ohm rheostat on the left hand end of the panel is removed from the original model. A 112 Amperite is used in place of this rheostat to control the r. f. tubes. Diagrams shows how to wire this in its proper place.

5—In place of the 10-ohm rheostat mentioned in the preceding paragraph, install a 50,000-ohm variable resistance. This is shunted across the mixer tube. See diagram.

6—Take out the following Amperites, mounted on the baseboard of the original model—

Amperite—1-A, controlling the detector tube.

Amperite—1-A, controlling first audio tube.

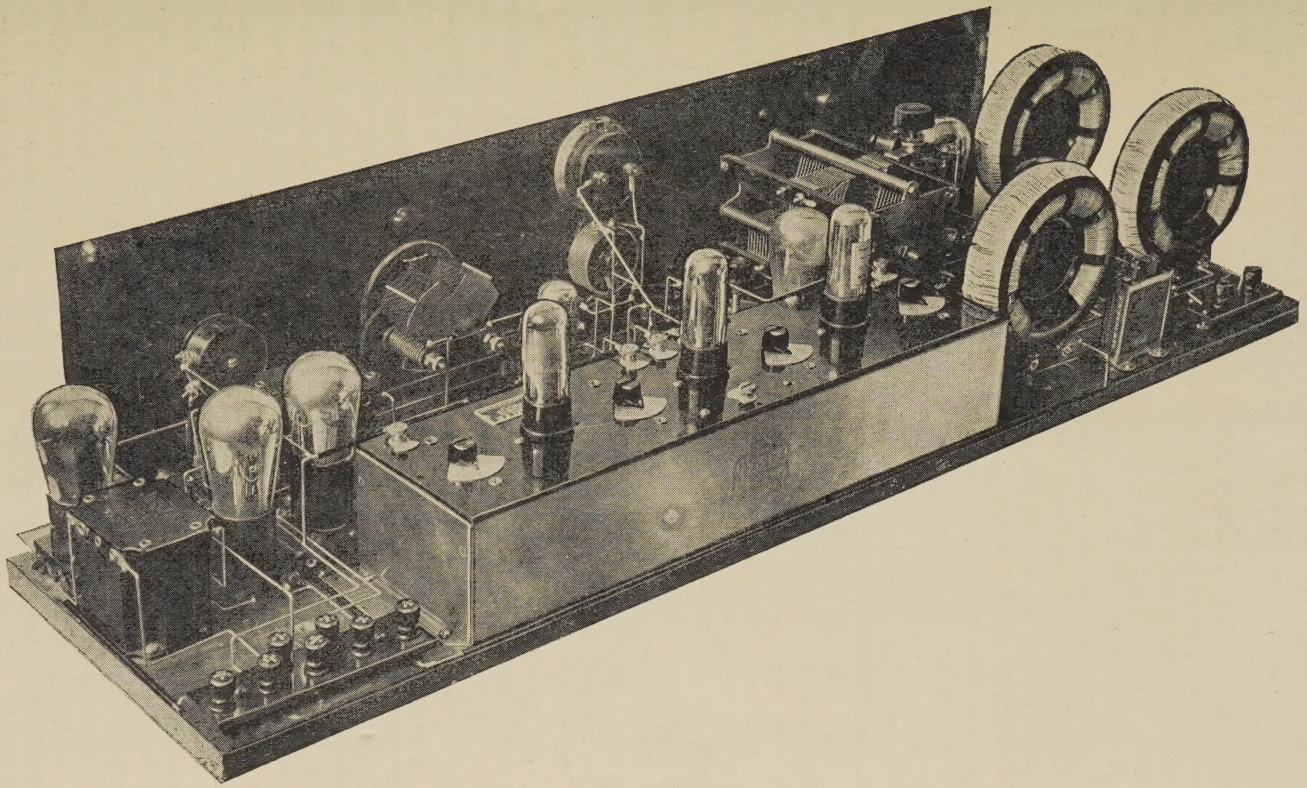
Amperite—112, controlling the power tube.

In place of these three separate Amperites, install one No. 1 Amperite, which now controls all three of these tubes. The diagram shows how to connect the No. 1 Amperite in the circuit.

It will also be noted that the baseboard layout is somewhat different. The mixer tube has been moved over next to the infradyne amplifier so as to make the shortest possible wiring between the plate terminal of this tube and the plate connector on the infradyne amplifier. This being an 86 meter lead, it is essential that it be as short and direct as possible. For this reason the new layout is more efficient than the first one.

The variable plate resistance of (3) gives a much smoother method of control than the filament rheostat and reduces the drain on the *B* battery by nearly eight milliamperes. Any good 200,000 ohm variable resistance may be used here.

The volume control is a 50,000 ohm variable resistance having an "off" position. It is very important to have this "off" position and the builder should examine his 50,000 ohm resistance carefully to see that the contact in this position is fully broken. If it is not, a decrease of 50 to 75% on weak signals will be experienced. At the present time, the writer knows of only one such variable resistance, the Frost No. 886. This method of cutting down volume on a powerful local station has the advantage of reducing it near the input end of the receiver. When the volume control is placed in the audio frequency amplifier it



Rear View

is frequently too near the output end of the circuit to control it without spoiling the tone quality. A powerful local station coming in through six stages of radio frequency amplification is sometimes so strong that the detector tube is flooded with more energy than it can handle. Distortion results and no amount of cutting down after this point will save the tone quality. By cutting down at the source obviously this trouble is eliminated and where the variable resistance has a full "off" position, the radio frequency losses caused by its introduction into the circuit are almost negligible.

The pictures show a binding post terminal block for battery connections. If desired this can be replaced by a seven-wire cable and plug. If the plug-in arrangement is used the seven wires should be run to the batteries as follows. Red to positive *A*, green to negative *A*, blue to 45 volt *B*, yellow to 90 volt *B*, pink to 135 volt *B*. Of the two other wires which are not wrapped inside the cable, one is black and the other brown. These may be used as *C* battery connections, running the black to negative 3 volts and the brown to negative 6 or negative 7½ volts. In order to complete the battery circuit, the positive *C*, negative *B* and negative *A* are then joined together externally. The antenna and ground wires are connected to a small binding post block at the left hand end of the set.

The filament circuit is quite different and is more efficient and less expensive to build than that originally given. The two incoming wave radio frequency amplifier tubes are lighted through a half ampere ballast resistor and the detector and two audio tubes are controlled by a one ampere ballast. The oscillator filament is connected directly in parallel with the three infradyne amplifier tubes and all four are controlled by the 30 ohm rheostat in the center of the panel. This filament circuit eliminates several ballast resistors that were used in the first circuit and is therefore cheaper and easier to build.

The Cardwell and Hammarlund factories have designed a special three-gang condenser. An accuracy of 1 mmf. over the entire scale is secured by this new design. This makes the three midget vernier condensers of value only in balancing up the external wiring to the condenser. Two of the midgets are mounted on the panel and the third one can be supported on its bus-bar connections inside the set. The midget that is inside the set may be left set at one-quarter or one-half its maximum capacity. The two midgets on the panel will then be used to balance the other two sections to the one across which this fixed midget is connected. This new triple condenser is responsible for the increased selectivity of the Sargent-Rayment infradyne, and if it is used, the midgets can be practically neglected in tuning as all three condenser sections will increase equally. Hammarlund has also announced a new 3-gang condenser for the infradyne. It has been approved for this circuit.

When the set is first put into operation, be sure that the 99 tubes are turned up to a full 3 volts as otherwise the oscillator tube will not oscillate. If this tube does not oscillate, the oscillator dial can be turned over the entire scale and it will make no difference whatever in the tuning.

Sometimes it is less confusing when the set is first put into operation to adjust the input amplifier separately from Infradyne amplifier. This may be done as follows: Take the four 99 tubes and the detector tube out of the set. Lift the wire from the plate terminal of the infradyne amplifier and connect this wire through an extension directly to the plate terminal of the detector tube socket. The set will now operate as a straight five-tube tuned radio frequency receiver and while in this condition may be adjusted for full efficiency for these five tubes. After this adjusting has been done, it will be an interesting experiment to tune in a station just barely audible on the five tubes and then connect in the Infradyne amplifier and see the tremendous increase in volume that results.

The original infradyne receiver was

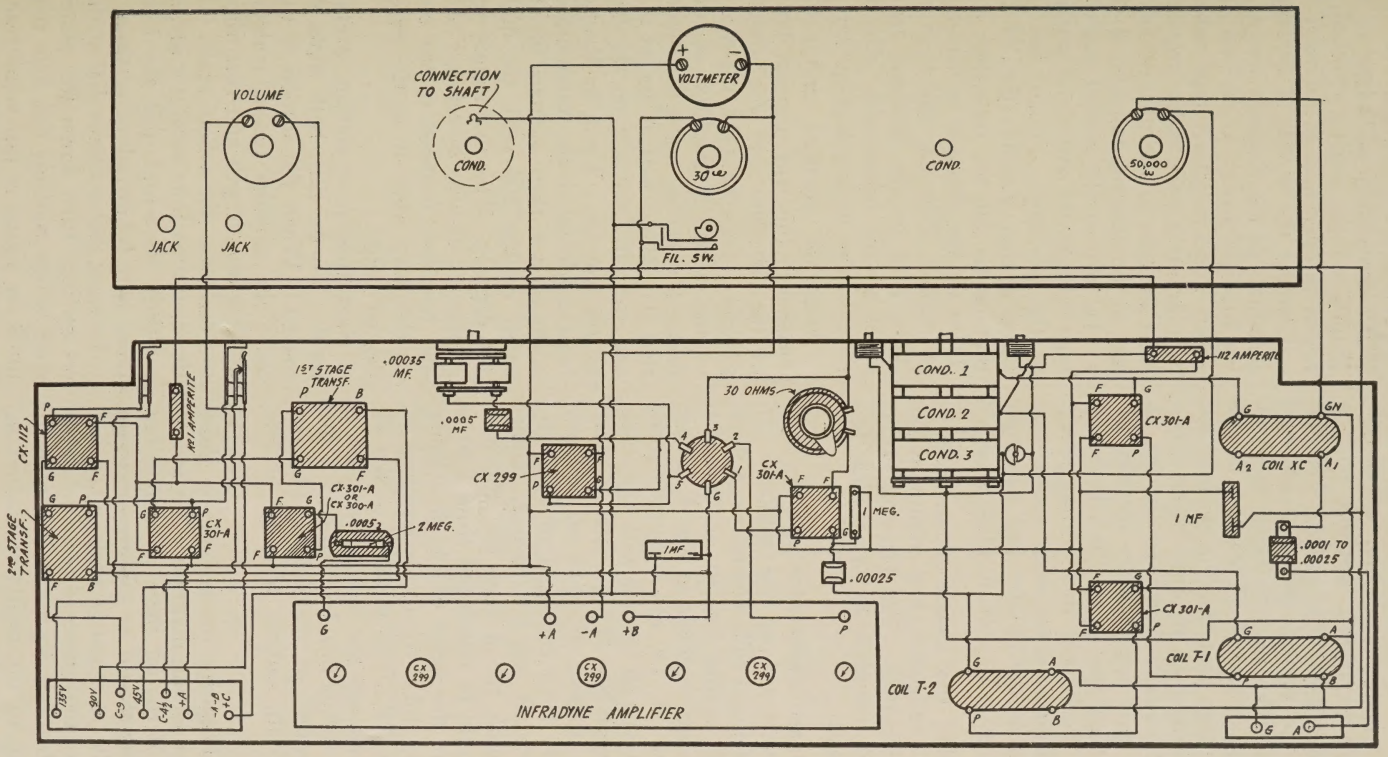


Fig. 5. Pictorial Wiring Diagram of the Infradyne

designed to work on a short inside antenna. This revised model, because of its much greater selectivity, works best with a 75 or 100 ft. antenna with a .0001 mfd. condenser in series. The pictures of the revised infradyne show a few parts different from those specified in the original article. This must not be taken to mean that these new parts are to be preferred as, in most cases either will work equally well. In the list of parts, the only ones that are specified by name are those that cannot be substituted for. All those parts that are not specified by manufacturers name are left to the option of the builder and any high quality parts will work in those places.

Regarding the choice of the midget balancing condensers, low minimum capacity is essential. The General Radio No. 368-A five plate vernier is ideal for this purpose.

The tapped inductance can be very easily constructed by the builder. It consists of three coils wound on a piece of bakelite tubing 1½ in. in diameter and 2 in. long, as shown in Fig. 4. These coils are of 14, 14, and 8 turns respectively and are all wound with the same direction with No. 24 d.s.c. wire. There should be a space of 1/16 in. between the two 14 turn coils and of 3/16 in. between the 14 and 8 turn coil. Commencing with the 8 turn coil the terminals should be numbered from 1 to 6 as shown in the sketch of Fig. 8, *1* being the outside and *2* the inside terminal of the 8 turn coil, *3* the terminal of the 14 turn coil nearest the 8 turn coil and *4* the other end of this 14 turn coil, *5* the inside terminal of the second 14 turn coil and *6* the outside terminal of this coil.

These numbers correspond to those used in the wiring diagram. To insure operation of the set these directions for coil winding should be followed exactly, particularly as regards their all being wound in the same direction. This tapped inductance should be mounted in the position of the oscillator coupler as shown in the baseboard layout.

To Put the Set in Operation

AFTER the set has been carefully constructed according to the diagrams and the wiring checked, the set is put in operation as follows:

Connect the 6 volt *A* battery to the terminals of the filament circuit. Turn the filament switch to the "off" position. Insert 201A or 301A type tubes in the two incoming wave radio frequency amplifier sockets, in the mixer tube sockets, and in the detector and first audio. Put a 112 tube in the second audio and 99 type tubes in the infradyne amplifier and in the oscillator. Turn the 30 ohm rheostat that controls the 99 tubes so that nearly all the resistance is cut in. Turn up the rheostat on the baseboard so that it is in the half way position. Then turn on the filament switch and see if all the tubes light. Do not turn the 99 tubes up any higher than 3 volts.

After the filament circuit has been checked in this way, connect up the rest of the batteries and the antenna and ground. Set the four indicator knobs on the infradyne amplifier at zero, turn down the screw marked "increase" so that it is about half as far as it will go and turn the rheostat on the baseboard all the way on. Turn the Remler oscillator condenser to the minimum capacity position and then tighten up the set screw on the dial with the dial set at 170 degrees. This dial should read in a counter clock-wise direction. After the dial has been fastened to the condenser in this way, turn it to the zero-to-100 degree range.

Next tune in a station, preferably a local. To do this, both dials must be moved. When the station is tuned in, leave the antenna tuning condenser set on that wavelength and turn the oscillator dial over the whole scale. Two or three or even four oscillator settings will probably be found and the loudest of these will be infradyne setting.

Leaving the oscillator dial at this loudest setting, turn down the plate resistance which controls the first two tubes until the signal is just comfortably audible. Then using the wooden adjustor

PANEL AND BASEBOARD LAYOUTS

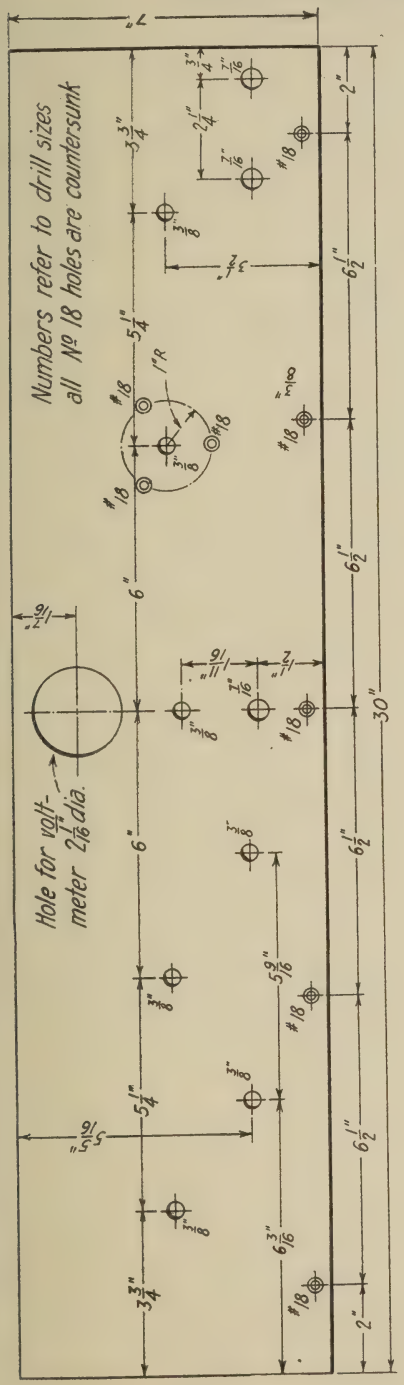


Fig. 7

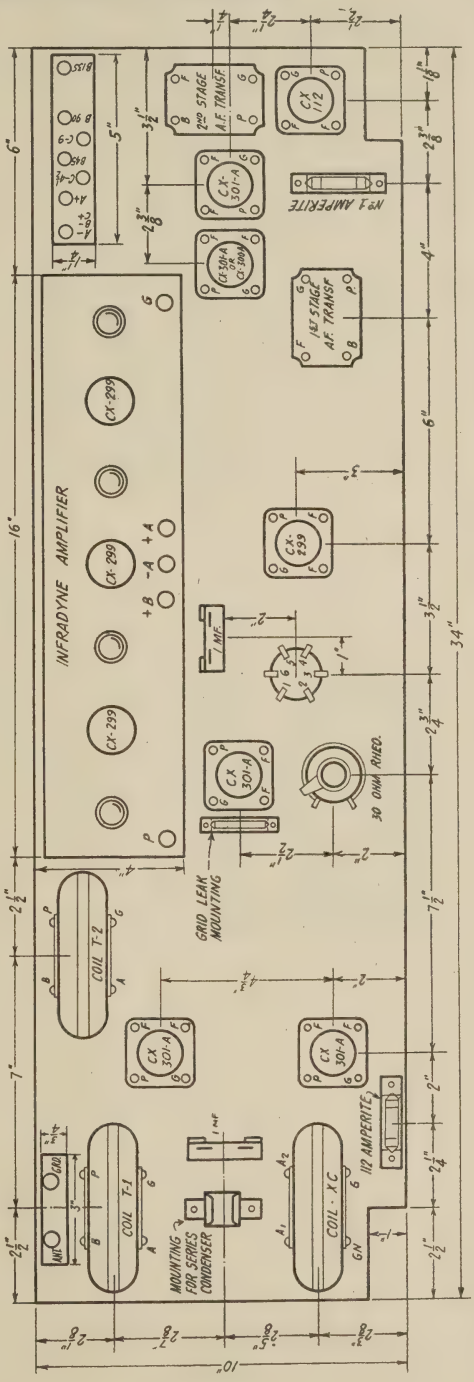


Fig. 6

that is furnished with the infradyne amplifier reset all four indicator knobs on the amplifier for maximum signal strength. If this throws the amplifier into oscillation, loosen up the increase screw until the oscillation stops. If it does not throw it into oscillation, tighten up the screw until it does, and then loosen it to just before this point. If it does not oscillate with the screw tightened all the way down, lift the wire from the plus *B* terminal on the infradyne amplifier and connect a little coil of about eight turns wound around the finger in series between the wire and the *B* terminal of the amplifier. In most cases this choke is not necessary but when it is used it should suffice to throw the amplifier into oscillation. No more than eight turns should be used in this place.

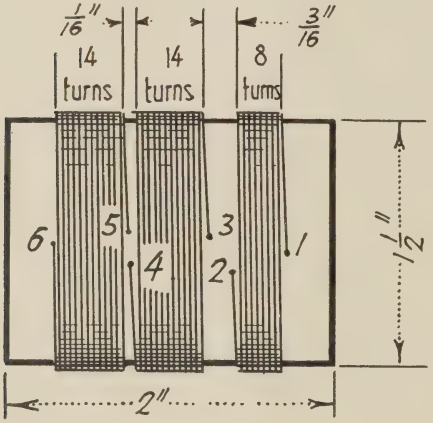


Fig. 8. Tapped Inductance

The 30 ohm rheostat mounted on the baseboard should next be turned until the most sensitive filament temperature for the mixer tube is found. This will probably be at about the half way position and will be indicated by a sharp rise in signal strength as the point of efficiency is reached. The signal strength should fall away rapidly on each side of this peak. If moving this rheostat throws the set into oscillation loosen up on the increase screw on the Remler amplifier and try again.

Because of the fact that the sum frequency is used, the oscillator condenser works in an opposite direction from the antenna condenser when the set is tuned. In order to make the dials read in the same direction, the oscillator condenser is equipped with a dial which reads opposite to its capacity increase.

It was mentioned above that with the antenna condenser set on a given station, two or three oscillator dial settings could be found. It should be pointed out, however, that this is the only condition under which more than one oscillator setting can be found. These other settings are freaks which are likely to appear in any set using an oscillator tube. Under normal operation of the set when both dials are turned together no more than one setting per station will be found. The oscillator condenser is connected between the grid and plate of the tube and both sides of the condenser are therefore alive to hand capacity. This limits the choice of an oscillator condenser to one in which the shaft is not connected electrically to either set of plates.

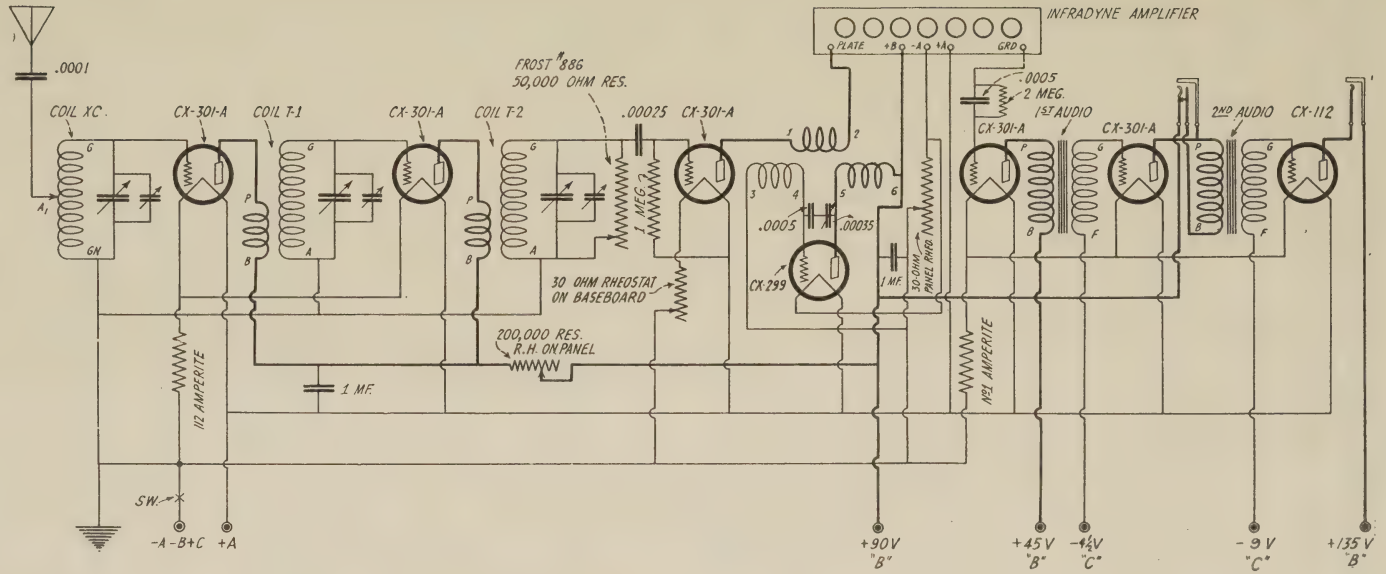


Fig. 4. Schematic Wiring Diagram of the Infradyne

NOTE: Connect Voltmeter as shown in Pictorial Diagram on Page 11.

HOW TO BALANCE THE CONDENSER IN THE ORIGINAL

1. Remove the tubes from the Infradyne Amplifier, the oscillator and the second detector.

2. Mount a vernier condenser (General Radio No. 368) on the panel at each side of the wavelength or left-hand dial at about the level of the vernier tuning knob. Leave these vernier condensers disconnected for the time being.

3. Disconnect the wire from the plate terminal of the first detector socket.

3-(a) Turn off the Infradyne Amplifier Rheostat (the one below the voltmeter). The voltmeter will then read zero.

4. Run a jumper wire from the plate terminal of the first detector socket to the plate terminal of the second detector socket. The set will now operate as a five-tube single-dial control tuned radio frequency receiver.

5. Tune in a local station on a wavelength between 400 and 500 meters.

6. Loosen the set screw holding the rear rotor section of the Continental condenser and shift the rotor section backward and forward until the signal comes in loudest. Tighten the set screw. If the radio frequency stages go into oscillation as the position of the rotor is shifted the oscillation can be stopped by cutting down the filaments on these two tubes.

7. Loosen the set screw holding the middle rotor section of the Continental condenser and move this section backward and forward until the station is received with the greatest volume. Tighten the set screw. Any oscillation of the radio stages can be stopped as before by cutting down the filament temperatures.

7-(a) Loosen the set screw holding the rotor plates of the front section of the Continental condenser and line-up this section in the same manner as in the preceding paragraph.

8. Note the sections in which the plates are farthest enmeshed.

9. Connect the two vernier or trimmer condensers across the sections in which the plates are farthest enmeshed. The rotor plates of the vernier condensers will be connected to the rotor sides of these two sections and their stator plates will be connected to the stator sides of the gang condenser sections.

10. Turn the vernier condensers to about half their maximum capacity.

11. Rebalance the circuits by again shifting the rotor sections as above described. The set will now be lined-up at one wavelength between 400 and 500 meters, and can be lined-up at any wavelength by using the trimmer condensers.

12. Log a few dial settings.

13. Remove the jumper wire and reconnect the wire to the plate terminal of the first detector socket.

14. Insert the tubes in the oscillator and second detector sockets and in the Infradyne Amplifier.

15. Set the panel voltmeter to three volts.

16. Turn the first detector rheostat, which is mounted on the baseboard, about three-quarters full on.

17. Turn the "Increase" screw on the Infradyne Amplifier panel almost all the way in.

18. Set the tuning knobs on the Infradyne Amplifier at zero. If the Amplifier goes into oscillation back up the "Increase" screw until the osciallation stops.

19. Set the volume control to maximum.

20. Tune in a moderately weak station. The settings previously obtained for the left-hand or wavelength dial can be used and it will be only necessary to obtain a setting for the oscillator dial.

21. Adjust the first detector rheostat on the baseboard for maximum volume.

22. Using the wooden wedge furnished with the Infradyne Amplifier vary the positions of the knobs on the Amplifier panel. Since the amplifier contains four tuned circuits any one of these can be tuned to any wavelength within its tuning range and the rest can be tuned to resonance with it. Therefore the first tuning knob can be set to any desired position over a certain range and the other three circuits tuned to resonance. There will, however, be a setting of the first knob and a resultant setting of each of the other three knobs a which operation will be best. Suppose then that as a first trial the left-hand knob is set at zero. The settings of the other three will then be varied slightly progressively and in turn until the points of best operation are found. As the setting of each knob is changed slightly rotate the oscillator dial slowly backward and forward over a few degrees. As each of the knobs on the Amplifier is adjusted and the circuit being tuned is brought into resonance with the circuit, the wavelength of which was determined by arbitrary setting, the amplifier will tend to go into oscillation. When this occurs unscrew the screw marked "Increase" until the oscillation stops. Set the four knobs successively for best reception. Now try another slightly different setting of the first knob and follow the above procedure through again. In this way the Infradyne Amplifier can be adjusted for best results.

23. Check the setting of the first detector rheostat, which is mounted on the baseboard.

LIST OF PARTS USED

By SARGENT IN HIS NEW MODEL

The Parts Specified by

MANUFACTURER'S NAME

Should Not Be Substituted

1 Remler Infradyne Amplifier.
1 Three Gang Condenser, Cardwell 317CL or Hammarlund.
3 General Radio type 318-A midget vernier condensers.
1 Remler .00035 mfd. condenser.
1 Frost No. 886 50,000 ohm resistance.
1 Tapped Inductance. See text.
1 30 ohm rheostat, baseboard type.
1 Set (3) Thorola or Camfield coils for .00035 condenser.
2 National type B, CCW dials.
7 UX base sockets. Cushion type (Benjamin).
1 No. 112 Amperite.
1 No. 1 Amperite.
1 30 ohm panel mounting rheostat.
1 200,000 ohm variable high resistance, Centralab.
3 2-inch Dials.
1 Filament switch.
1 Single closed jack.
1 Single open jack.
1 Jewell 0-5 DC voltmeter. Pat. 135.
1 Electrad grid leak mounting.
1 1 meg. grid leak, Durham, Lynch, Electrad or other good leak.
1 2 meg. grid leak, Durham, Lynch, Electrad or other good leak.
1 .0001 fixed condenser.
2 .0005 fixed condensers.
1 .00025 fixed condenser.
2 Audio transformers.
2 1 mfd. Condensers.
1 Panel, 3/16x7x30 in.
1 Baseboard, ¾x10x34 in.
9 Eby binding posts or 2 Eby posts and a Jones battery plug and cable.

Converting a Five-Tube Set to An Infradyne

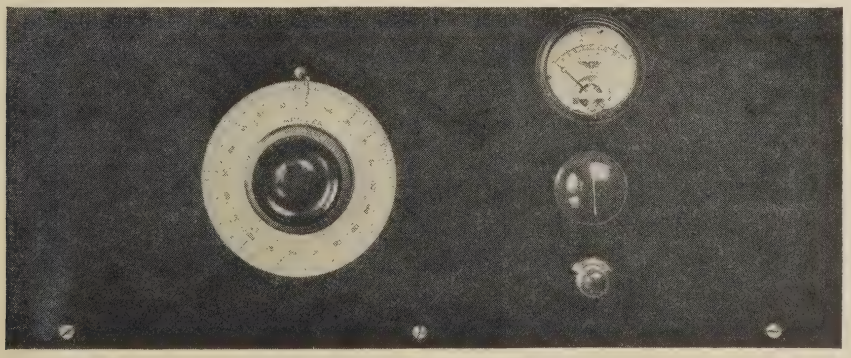
A Description of An Infradyne Adapter Applicable to Any Tuned R. F. Set. Also Some Suggestions for Selectivity.

By E. M. Sargent

THOSE who have followed the series of articles on the infradyne circuit which have been appearing in "RADIO" since August, 1926, have recognized the fact that a complete infradyne set consists of a five-tube tuned radio frequency set *plus* an oscillator-mixer and a three tube infradyne amplifier unit. In operation, the received signal is first amplified at radio frequency in the first two stages, then changed to a low wavelength of about 90 meters by the oscillator-mixer, then amplified to a still greater degree by the three stages in the infradyne amplifier, then detected or de-modulated by the detector tube, and finally amplified by two audio frequency transformers and tubes. In effect, an oscillator-mixer and infradyne amplifier have been merely added to a five tube set.

That this addition can be easily made to almost any tuned r.f. set, including the neutrodyne, has been conclusively demonstrated during our laboratory tests. Consequently we have designed an infradyne adapter which will transform an existing five tube set into a complete ten tube infradyne set. This change can be readily made in a few minutes by simply adding the oscillator, infradyne unit and second detector whose constructional details are given elsewhere in this booklet.

As may be seen from the adapter circuit diagram in Fig. 1, the output from the plate of the original detector tube, now used as a mixer to give the *sum* frequency, is connected to the infradyne adapter. Then the output of the infradyne adapter is connected to the input of the first a.f. transformer. This, with the necessary battery connections, completes the job. The only changes made in the original set is to disconnect the wire joining the plate terminal of the detector socket to the *P* terminal of the first audio frequency transformer, to remove the audio by-pass condenser in the tuned radio frequency set (if there



Panel View of Infradyne Adapter.

is one), and to add a 30-ohm control rheostat for the first detector tube (if not already installed).

To add the infradyne adapter, connect its input terminal (point *1* of the tapped inductance) to the plate terminal of the detector socket and its output (the plate of the 2nd detector) to the *P* terminal of the first a.f. transformer. Then make the battery connections as indicated in Fig. 1, first disconnecting the *A* battery from the set.

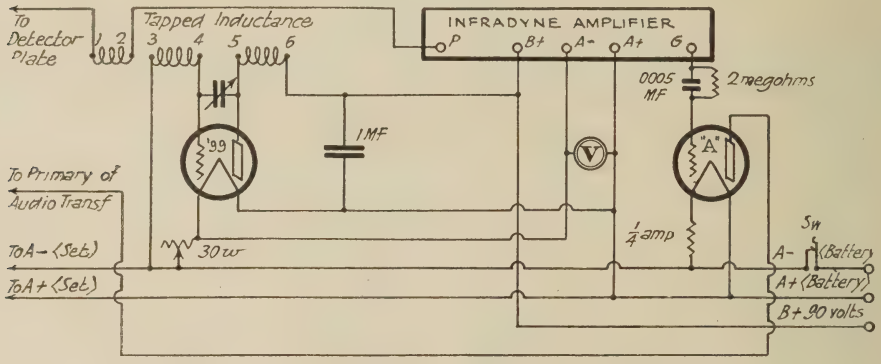


Fig. 1. Circuit Diagram for Infradyne Adapter.

The complete unit to be added can be mounted on a panel and baseboard, as shown in the pictures, and installed in a separate cabinet which may be placed near the main set so that the additional dial control of the oscillator can be conveniently operated.

The panel is 7x18x3/16 in. and the baseboard 9x17x3/4 in. The parts used in the pictured unit are 1 Remler No. 700 infradyne amplifier, 1 Remler .0001 mfd. variable condenser, 1 Sangamo .0005 mfd. fixed condenser and 2 meg. leak, 1 bypass condenser (1mfd.), 2 CX type tube sockets, 1 d. c. voltmeter (0-5 volts), 1 rheostat (30 ohms, Frost), 1 ballast resistance (¼ amp.), 1 filament switch, 7 binding posts, and 1 tapped inductance.

The tapped inductance consists of three coils, one 10 turn and two 30 turns of No. 24 d.s.c. wire, all wound in the same direction on a 1⅝ in. diameter formica tube 3 in. long, as shown in Fig. 2. The space between turns is ⅛ in.

All connections should be soldered. If solid solder is used, a non-acid soldering paste is the best flux, using the paste very sparingly, especially in the vicinity of the tapped inductance. If rosin core solder is used no other flux is necessary. But take care to "sweat" the joint with the hot iron until the solder runs into place, giving the wire a tug to be sure that the solder and not the rosin is holding the wires together. As rosin is a non-conductor and does not ruin insulation rosin-core solder is particularly good if properly used.

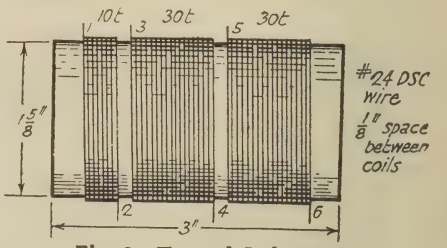


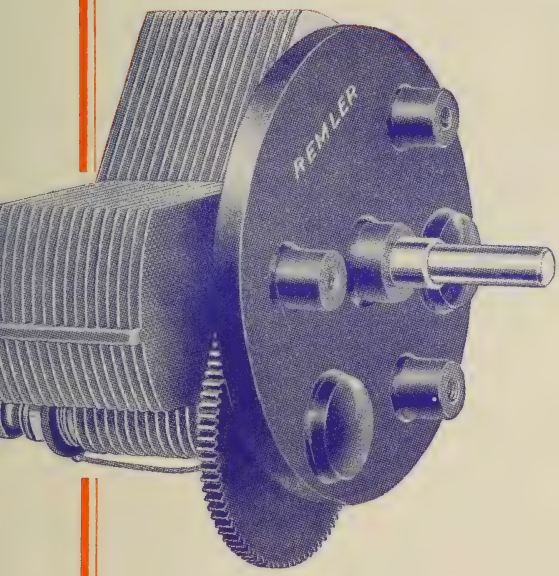
Fig. 2. Tapped Inductance.

Operation

USE "A" tubes in the first four sockets of the tuned radio frequency set and either an "A" tube or a power

REMLER

Remler TWIN ROTOR Condenser



Made in both Straight Line Frequency and Straight Line Wave Length types. Condenser rotates through a full 360°, giving a greater separation of stations at all wave lengths than is possible with the usual 180° type.

A special adjustment which permits variation of the condenser capacity at zero dial setting allows a still further spreading of the stations in the Straight Line Frequency type. In consequence the condenser can be adapted to the particular coil used. Perfected insulation completely eliminates body capacity effects and electrical losses are reduced to a minimum.

Straight Line Frequency

This type gives the greatest possible separation of stations over the entire broadcast band. Equal divisions on the dial represent equal frequency bands. Longer wave length stations are crowded somewhat and the lower wave length stations are proportionately spread out. Capacity is variable at the zero dial setting.

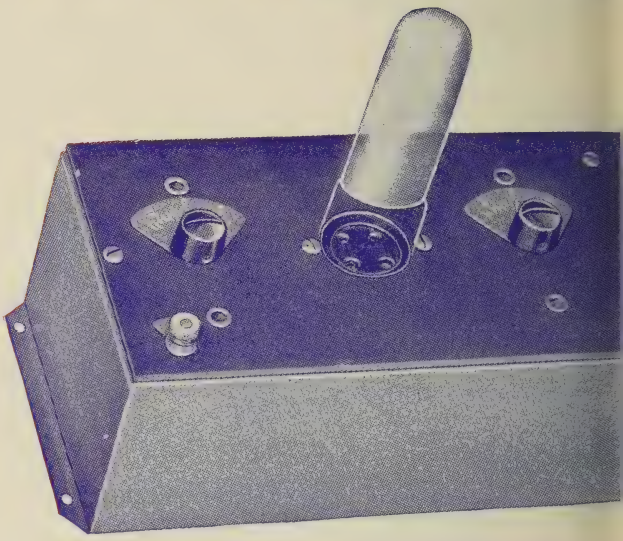
No. 648—.00035 max. less dial....$4.50
No. 649—.0005 max. less dial.... 4.50
No. 659—.0001 max. less dial.... 4.50

Straight Line Wave-Length

This type should be used to separate to the greatest extent the long-wave class "B" stations which usually offer the better programs. Equal dial divisions represent equal wave-length bands. The smaller low-wave length stations are slightly crowded to give maximum spacing for the higher powered class "B" stations.

No. 630—.00035, with dial.....$5.00
No. 638—.00035, less dial..... 4.50
No. 631—.0005, with dial..... 5.00
No. 639—.0005, less dial..... 4.50
Dial Complete..... .75

Remler INFRA+

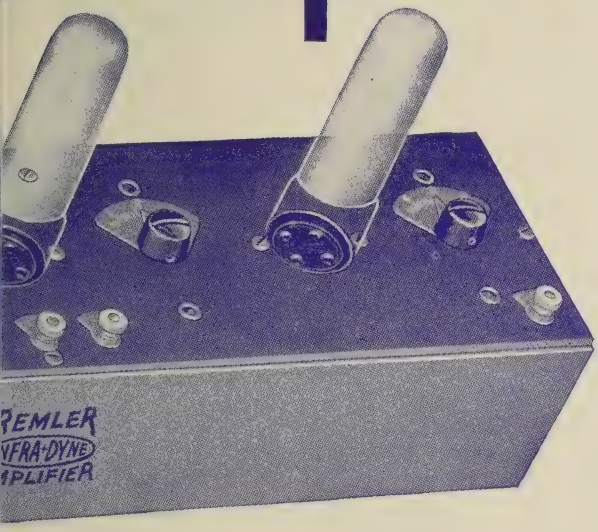


The Key to Succes

The name Remler is indicative o
resenting many years' accomplis
neering. This, the No. 700 Reml
highest achievement of those y
neering design. Use it with you
dyne circuit—you will get recep
past experience, you have ever b

List Pr

NE Amplifier



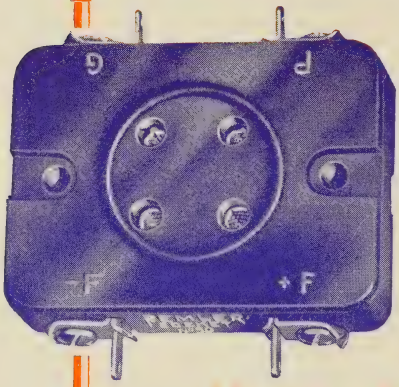
sful Amplification

ne best in radio equipment, rep-
ent of pioneers in scientific engi-
nfradyne Amplifier, exhibits the
of experience and skilful engi-
ned radio frequency or neutro-
far ahead of any that, through
lead to expect.

$25.00

REMLER

Remler *Improved* Socket



Contact—close, positive, gripping contact—is the secret of success in all radio connections. It is not enough that contact should be made at a given point or even along a given line. Too often is insufficient contact the source of long unsuspected trouble. The fact that the best practice demands the soldering of all permanent electrical connections is additional proof of this point.

Made to Meet the Quality Demand

Made of moulded Bakelite and easily installed, this new Remler socket will at once make a real appeal to the man who realizes the necessity of perfect contact for the tubes. The contacts are self aligning, and the full floating springs allow a smooth in-and-out pull. Both soldering lug terminals and screw terminals are provided for each connection, and each contact spring is an integral part of the terminal lug.

List Price 50 Cents

REMLER

GRAY and DANIELSON Manufacturing Company

DIVISION OF R

CHICAGO

260 FIRST STREET
SAN FRANCISCO

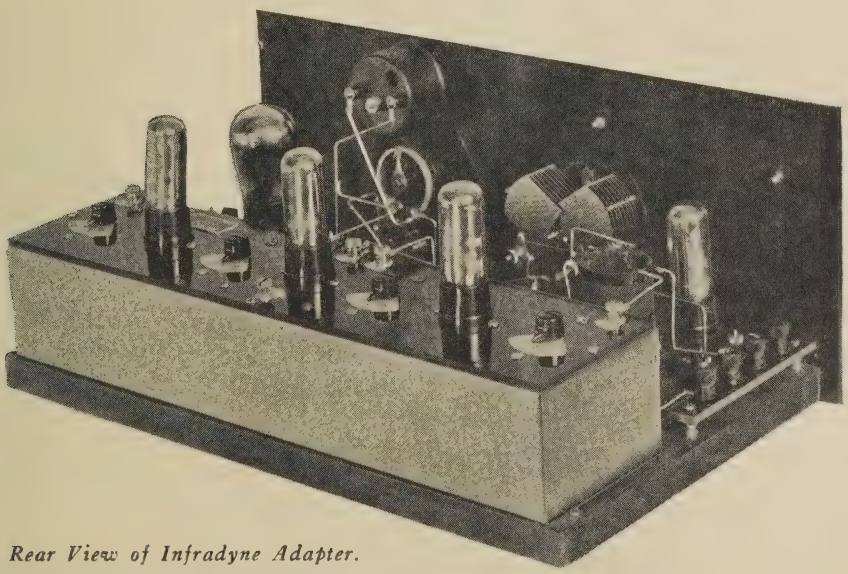
NEW YORK

tube in the last audio stage. In the adapter, use three 99's in the infradyne amplifier, a 99 in the oscillator and an "A" tube in the detector. If the oscillator coil is built with care, and the Remler .0001 mfd. condenser used with the "high minimum" setting (see instructions regarding this in the condenser box), the Remler dial will set at about 48 degrees for 550 meters, and 142 degrees for 200 meters. This is a straight line frequency condenser and therefore the 96 channels used in broadcasting will be evenly distributed over the 94 degree swing of the condenser. This is practically one degree per wave band, which greatly simplifies tuning.

In the infradyne circuit, the oscillator condenser turns in the opposite direction from the tuning condensers. That is, the highest capacity setting is used to get 200 meters and the lowest to get 550 meters. This makes the tuning somewhat confusing if the regular Remler dial is used, and the writer recommends that this dial be replaced with a CCW dial. Also there is no reason why the dial should permanently read from 48 degrees to 142 degrees, and it is better after the limits of the broadcast band have been ascertained to reset the CCW dial so that it is on 0 for 200 meters.

To put the set in operation, the writer recommends making the adjustment on a moderately distant station,—some station that is out of daylight range but that comes in loud at night. The dial settings on the tuned radio frequency set will be in exactly the same places as when that set is used alone, and they can therefore be made in advance if a log sheet is at hand. Put the four indicators on the infradyne amplifier at 0, tune in the station with the dials on the tuned radio frequency set, and then slowly rotate the oscillator dial until the station is heard.

Sometimes the station can be picked up at more than one place on the oscillator if the other dials are not also moved. If this happens, locate all possible oscillator settings and select the loudest one. This will be the infradyne setting. These other oscillator settings are freaks which occur in any set using an oscillating tube, and the only time



Rear View of Infradyne Adapter.

they appear is during a test of this kind. During normal operation of the set, no station ever appears more than once, unless the broadcast station itself emits a harmonic, in which case of course it will be heard on any set on one-half its fundamental wave length.

After the oscillator setting is determined, adjust the four indicators on the infradyne amplifier for maximum sensitivity, and also adjust the "increase" screw as per the instructions that come with the amplifier. If the set will stand it, a small by-pass condenser, usually not over .0001 mfd., may be used across the first audio transformer. This should not be put in, however, until the receiver and adapter have been tried without it first, as the insertion of this bypass sometimes causes troublesome oscillations.

This infradyne adapter makes a big improvement in a 5-tube set and true infradyne results can be expected. It is particularly good with sets of the single dial variety, as the resulting receiver is then only a two dial set and is easy to operate.

How to Use the Na-Ald Connectorald for adapting the Infradyne to an ordinary 5-tube tuned radio frequency receiver

TO SIMPLIFY connections in converting your five-tube radio frequency receiver to an Infradyne, you can use the Na-Ald Connectorald. This device has a little shell with a base that fits on a tube socket. Put the Connectorald on the detector tube base. The Connectorald has four leads. Then insert the detector tube in the socket on which the Connectorald has been attached.

There are 4 leads on the Connectorald, labeled as follows:

Plus B
Minus B
Plus C
Minus C

The Plus *B* lead goes to terminal 1 of the pick-up coil.

The Minus *B* lead goes to the plate of the second detector.

If your tuned radio frequency receiver has a grid condenser and grid leak in it, connect the plus *C* and minus *C* together. If the set has no grid leak and grid condenser in it, connect the grid condenser in series with the plus *C* and minus *C* leads coming from the Connectorald. Shunt this grid condenser with a grid leak of one or two megohms.

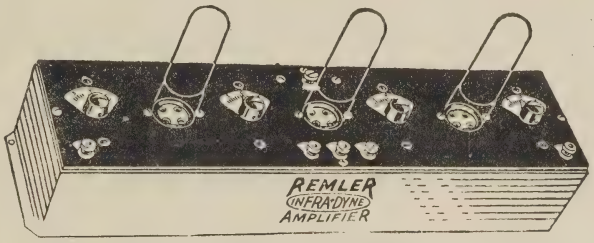
If your receiver has a by-pass condenser across the first audio transformer, be sure to take this out. If you care to use a condenser, do not use one of more than .0001 mfds. capacity.

The Amplifier Unit

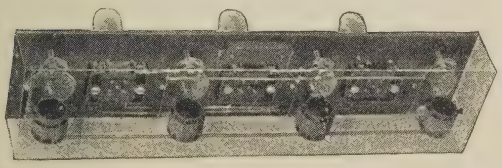
THE heart of the Sargent-Rayment Infradyne circuit is the Infradyne amplifier. The illustrations show the interior and exterior views of this device. The circuit diagram shows how the unit is wired. The circuit will be of interest to those who have been experimenting with amplification at the extreme high frequencies. The circuit is published as a matter of information only. It is impossible to give construction details because of the fact that a difference in placement of the fixed condensers of ¼ inch or a difference of 1/32 inch in primary to secondary coupling between the coils may make the difference between a unit that will amplify and one that won't. The Infradyne amplifier is a most outstanding example of the part played in a radio circuit by the relative positions of the different pieces of apparatus.

If exactly the same hook-up, capacities, and coils are used and the arrangement kept almost the same, but the connecting wires run differently, the unit will have entirely different characteristics. Such is radio at 90 meters.

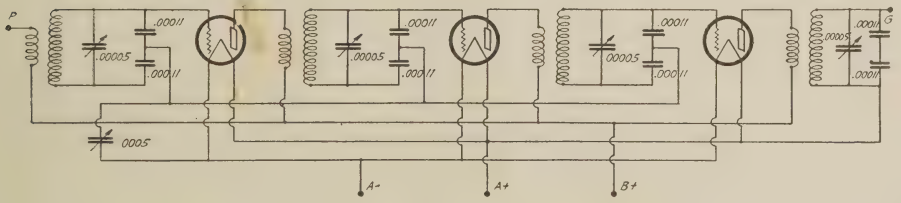
Unless you have at your disposal a complete radio calibration laboratory it will be practically impossible for you to build an amplifier unit that will give results. Each unit is calibrated by laboratorians in the factory. Each circuit is tested. All parts are inspected and all inductances and capacities are carefully checked and matched before the amplifier unit is assembled. It is housed in a copper container, effectively grounded. This provides an ideal shield for the entire unit. The 90-meter transformers are wound on low-loss ribbed forms. 35 turns of No. 28 d.s.c. wire on 1⅛ inch forms are used on the secondaries with the exception of the coil next to the second detector. This coil has 28 turns. Primaries are wound inside of the secondaries, and consist of 20 turns of No. 28 d.s.c. wire. The bakelite top of the unit has three "X" base sockets, four vernier condensers and the necessary connecting posts. The vernier condensers are adjusted for maximum signal strength. Once this adjustment has been made there is no further attention necessary.



The Unit in Its Container.



Interior View of Amplifier.



Circuit Diagram of Infradyne Amplifier Unit.

Where to Get Information

A "trouble shooting" service for Infradyne receivers is being maintained by many radio parts dealers in various sections of the U. S. Those wishing to secure expert advice on the circuit and others desiring information should correspond with any of the following:

E. M. SARGENT,
1200 Franklin Street, Oakland, California.

L. C. RAYMENT,
1200 Franklin Street, Oakland, California.

GERALD M. BEST,
Technical Editor of "RADIO,"
Pacific Building, San Francisco, California.

Questions are answered by Gerald M. Best when accompanied by twenty-five cents in coin or stamps for each question asked.

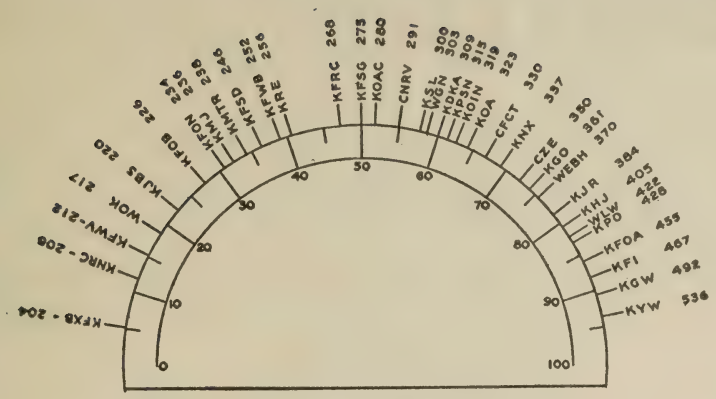
E. M. Sargent writes exclusively for "RADIO." Every month for the next six months his down-to-the-minute developments on the Infradyne will be published in "RADIO."

Hammerlund & Cardwell

Announce

Infradyne Condensers

As this Manual goes to press, word reaches us from Mr. E. M. Sargent that two new three-gang condensers for the Infradyne have been announced. One is made by Cardwell—the other by Hammarlund. Both have been endorsed by Mr. E. M. Sargent. The Hammarlund and Cardwell factories are making a special condenser for the Infradyne. Specifications for these condensers were carefully checked by Sargent. They will give 100% satisfaction. Lack of time prevents us from showing a pictorial drilling template for mounting these new condensers on the Infradyne panel. The panel lay-out, as shown on Page 13, gives the center shaft hole drilling dimensions only. This same shaft hole can be used for either the Cardwell or the Hammarlund Infradyne condenser, but it will be necessary for the builder to drill three additional holes for mounting the condenser to the panel. These holes should be countersunk and flat head screws used for mounting the condenser. Before drilling these holes, make a paper template by placing a sheet of paper over the front end of the condenser and carefully marking the location for drilling the holes for the mounting screws. Use a stiff grade of paper.



The Dial

of an

INFRA-DYNE

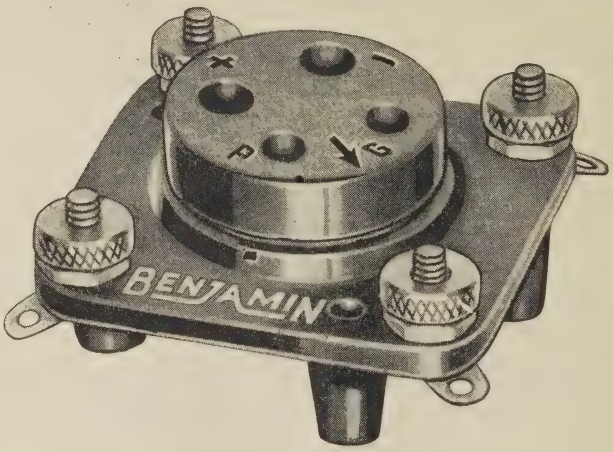
This illustration shows the actual results obtained from the Sargent-Rayment Infradyne Circuit.

You will get results equally good when you use it. Only via the Infradyne route can you secure broadcast reception which will be far superior to that from the ordinary run of receivers. The readings shown are taken from the antenna dial. The oscillator dial readings will be within 10° of the wavelength dial readings.

BENJAMIN
TRADE MARK

Cle-Ra-Tone Radio Sockets

Spring Supported, Shock Absorbing



used in the New INFRADYNE Reciver

The new INFRA+DYNE Receiver is a marvel for long distance reception, simplicity and ease of tuning because of Mr. E. M. Sargent's insistance on radio parts of proven merit. Benjamin Cle-Ra-Tone Sockets were chosen because they are shock-absorbing, non-microphonic—they give longer life and protect the tubes from sudden impacts which would otherwise cause "tube noises." Four perfectly balanced springs "float" the tube-holding elements independently of the base, with positive tube-to-terminal connection. Shock-absorbing feature not affected by stiff bus wiring. Made of molded Bakelite —highly polished. Nickel plated screws and nuts, tinned soldering terminals. Side wiping contacts assure perfect connections.

Cle-Ra-Tone Sockets for UX Type Tubes, 75 Cents

Your dealer has them in stock

BENJAMIN ELECTRIC MFG. CO.

Pacific Sales Dept.: 448 Bryant St., San Francisco

Eastern Sales Dept.:
247 W. 17th St., New York

General Offices:
120-128 S. Sangamon St., Chicago

Manufactured in Canada by the Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Ontario

ALL PARTS $118.00

INFRA-DYNE
TRADE MARK

Prompt Mail Order Service To Any Part of U. S. or Canada

WE MAKE PROMPT DELIVERY

Parts Also Sold Separately

We specialize in shipments of complete parts for the new improved Infradyne. Everything specified by Sargent in this Manual will be shipped to you for $118.00. This price includes the new type Cardwell 3-gang condenser; three new General Radio vernier condensers; the new Frost 50,000 ohm variable resistance, the new 200,000 ohm variable resistance and the new set of Amperite filament controls which are explained by Sargent in his latest article. In other words, the list of parts to the right is exactly what is needed for building the new Infradyne. We guarantee the merchandise to be exactly as represented and we will ship c.o.d. if half cash is sent with order. Money orders or certified checks accepted. We have been supplying the Infradyne builder's wants for the past three months and we have a host of satisfied customers.

Here are the Official Parts Which We Sell

1 Remler Infradyne Amplifier.
1 Cardwell three-gang condenser.
3 General Radio 318-a Midgets.
1 Remler .00035 condenser.
1 Frost No. 886 Resistance, 50,000 ohms.
1 Tapped inductance.
1 30 ohm baseboard rheostat.
1 Set, 3, Thorola Doughnuts.
2 National Dials, Type B. CCW.
7 Benjamin UX base sockets.
1 112 amperite.
1 No. 1 amperite.
1 30 ohm panel rheostat.
1 Centralab 200,000 ohm resistance.
3 2-inch dials.
1 Filament switch, Electrad.
1 Single closed jack, Electrad.
1 Single open jack, Electrad.
1 Jewell Pat. 135 voltmeter.
1 Electrad grid leak mount.
1 1 meg. Electrad grid leak.
1 2 meg. Electrad grid leak.
1 .0001 Fixed condenser, Electrad.
1 .00025 Fixed condenser, Sangamo.
2 .0005 Fixed condensers, Electrad.
2 Amertran audio transformers.
2 1 mfd. Electrad condensers.
2 Binding post strips with Eby Posts.
1 Bakelite Panel, drilled and engraved, 3/16" thick.
1 Baseboard, Poplar, Egyptian lacquered.

All of Above.....$118.00

WIRES

All of the wires, bent to shape. Saves you the trouble and saves hours of time. Neatly packed and labelled, with instruction sheet.

$6.00

CABINETS

Beautiful mahogany cabinets built especially for the Infradyne. They do justice to this famous set.

$19.50

C.O.D. shipments made if half cash accompanies order.

International Radio Sales Co.

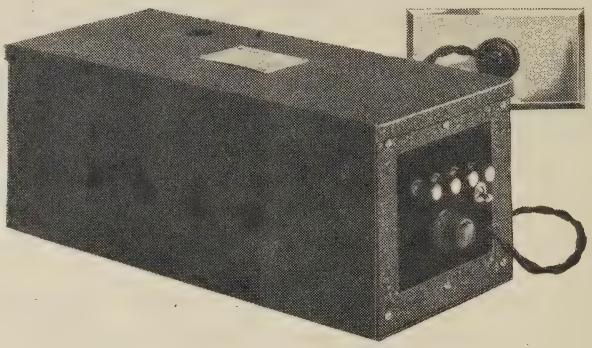
Address Orders to Dept. M.

5441 CALIFORNIA STREET. SAN FRANCISCO, CALIF.

How to Tune In Stations More Than 2000 Miles Distant

Hair-breadth selectivity is required for tuning-in stations several thousand miles away. The secret of bringing in these stations is in the proper control of the tuned r.f. amplifier, assuming that the oscillator and Infradyne amplifier are performing correctly. Infradyne users report that stations three meters apart are easily separated from powerful local stations on the antenna dial. Carefully follow the instructions contained elsewhere in this manual for lining-up the three gang condenser. Unless the gangs of this condenser are properly lined up, it will be impossible to get selectivity. Set the antenna tuning dial at, say, about 30 degrees for tuning in stations on low wavelengths. Leave it in that position. Then "cross" this wavelength with the oscillator dial by moving it slowly back and forth over a range of about five degrees on either side of the same dial reading as on the antenna dial. When you "cross" a station in this manner, set the oscillator dial at the point where the station comes in clearest and loudest. Then vary the voltage of the "99" tube filaments until you get clear, undistorted reproduction of signals. Do not use more than three volts on the small tubes. Keep your eye on the voltmeter. Distortion will result if too much voltage is used. You will also force the oscillator and Infradyne Amplifier tubes and long distance stations will not come through satisfactorily. The two tuning dials will not always read alike. They should not vary more than five or ten degrees. For this reason it is essential that the oscillator dial be swung back and forth over a ten degree sector of the scale until you "cross the station." Regulate your variable high resistances until you get undistorted signals. The control of the 50,000 ohm resistance plays an important part in getting good reception from long distance stations. A slight re-adjustment of the rheostat on the baseboard may give you a better "peak" point for DX stations.

Operate your INFRA-DYNE with 100% Efficiency



Precision

"B" Power Unit
135 Volts $42.50

Infradyne's 10 tubes require considerable B voltage—this sensitive circuit requires an exceptionally even flow of B current as well as an ample supply. This is so in a greater or lesser degree in all circuits, but in Infradyne it is even more important. Precision will deliver an even flow of "B" current that will operate the Infradyne with 100% efficiency—a reserve of Power that is not taxed at any time. An absolute quiet flow of "B" voltage.

Infradyne draws a maximum of 26 milliamperes at 135 volts, using a CX112 power tube in the last audio stage.

Precision has an output of 40 milliamperes at 135 volts—a condensing capacity of 100 microfarads—assuring you an uninterrupted flow of current indifferent to temporary power line interferences.

This advertisement is placed in this publication because Precision has proven its efficiency in operating the Infradyne. If your dealer can't supply you, write us for full information.

Precision Electric Mfg. Corp.

1020 Santa Fe Avenue
Los Angeles

How to Bend Wires and Solder Connections

Great care should be taken in bending wires and soldering connections. Use a good grade of copper wire, insulated where insulation is required. It is not advisable to bend and re-bend bus-bar wiring. Try to find the exact place for making the bend in the first place. Hardware stores sell a handy pair of wire-bending pliers which have a combination round and smooth flat nose. Do not use pliers with "teeth" or "ribs" because you will mar the insulation on the wires and a poor job will be the result.

Use lugs. Use them liberally. But do not use too much solder. "Sweat" the joints by using solder sparingly and see that the soldering iron is heated to a sufficient temperature to allow the joints to "sweat" together. If you use rosin core solder take great care that the rosin is thoroughly melted and allow the solder to run smoothly over the joints. Do not use too much rosin or soldering flux. A little of this goes a long way toward making a good joint. Carefully wipe the rosin or paste from the wires and instruments. High resistance leaks will result if paste is not thoroughly removed. The secret of good soldering is in the proper temperature of the iron, the correct amount of solder and flux and the manner in which this is applied. Do your experimenting on some scraps of wire before attempting to wire your Infradyne. Run leads as short and direct as possible—especially in the grid circuit. Keep the grid leads well separated from other wires.

After a connection has been soldered it is always advisable to test its strength by gently pressing it. A poor joint will give 'way under slight pressure.

TYPE OF ANTENNA
To Use for the Infradyne

That "No Chain Is Stronger Than Its Weakest Link" can be safely applied to the antenna for use with the Infradyne. The Infradyne gives best results when used with an antenna not more than 100 feet long. A 75-foot antenna will give excellent results although 100 feet can be used in connection with the Improved Infradyne. Greater flexibility of antenna tuning control is accomplished in the new model by the use of the trimmer condensers and other minor improvements as made by the inventor. The original Infradyne operates best with a 50-foot antenna. If you bring your set up to date as shown in this Manual you can safely use an antenna up to 100 feet in length. An indoor antenna can be used for reception from stations up to 1000 miles distant. In San Francisco an Infradyne receiver using a fifteen foot wire stretched along the floor succeeded in picking up KOA at Denver with enough volume to fill the room. The selectivity of the Infradyne will be impaired if more than 100 feet of antenna is used. Use copper wire for the antenna. Do not use smaller wire than the equivalent of No. 14. Thoroughly insulate the wires at both ends. Use a good lead-in wire. Make sure that your ground connection is perfect. Use a good ground clamp. Make the distance between the set and ground connection as short as possible. The ground connection is as important as the antenna itself.

A TRIBUTE

Mr. E. M. Sargent and Mr. L. C. Rayment have this to say in regard to the nation-wide overnight popularity of the Infradyne:

"The magazine 'RADIO' of San Francisco, with its ultra-conservative and unbiased editorial policy and its reader confidence gained through nine years of fair play—with its national reputation as a magazine entirely free from sensationalism, is greatly responsible for the success of popularizing the Infradyne circuit."

The publishers of "RADIO" announced that the Infradyne was new—revolutionary—ultra-selective and a remarkable circuit for bringing in the extreme long distance stations. The radio public believed this statement because it came from "RADIO." Reader confidence is our greatest asset. We published this latest radio scoop months in advance of others. If you care to join the ranks of subscribers to this pioneer radio magazine, kindly send us a check or money order for $2.50. That brings you "RADIO" for a full year.

PACIFIC RADIO PUBLISHING CO.

Established 1917

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Tech. Editor

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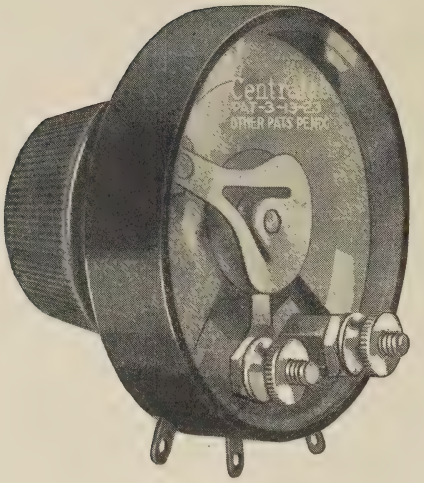

Centralab
RadiohM

HEAVY DUTY
Centralab
RadiohM

Non-Inductive Variable High Resistances

CENTRALAB Radiohms with two terminals, and Modulators or Potentiometers with three terminals, provide gradual, noiseless control of oscillation or volume in any circuit. Specified for the Infradyne, S-C, Samson T-C, Henry Lyford, Universal, and many other circuits. Used as standard equipment on a large number of commercial receivers, and by both the U. S. Navy and Signal Corps.

There is a resistance and correct taper for every circuit. The No. 25 M or No. 51 M are ideal oscillation controls when shunted across the tickler coil of short wave receivers.

Bakelite base and knob. Single hole mounting. Resistance of Potentiometers. 400 or 2000 ohms, modulators 500,000 ohms, Radiohms 2000, 25,000, 50,000, 100,000, 200,000, 500,000 ohms, $2.00.

Gives Full Efficiency from "B" Eliminators

Centralab Heavy Duty Radiohms *fully approved by the Raytheon Laboratories,* will control the output voltage of "B" Battery Eliminators, resistance remaining permanent as adjusted and the same for any knob setting. Full resistance variation with a single turn of knob. Insulated for 1500 volts. Smooth and noiseless to outlast the eliminator, $2.00.

At your dealer's or mailed direct.

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Australian Representative
United Distributors, Ltd., Sydney

Canadian Representative
Irving W. Levine, Montreal

Great Britain Representative
R. A. Rothermel, Ltd., London

Makers of variable resistance for 69 makers of leading standard sets.

Mr. L. S. Hillegas-Baird, 9HO, will cheerfully answer inquiries and supply circuits and descriptive literature.

Centralab
CRL

IMMEDIATE DELIVERY
(Wholesale Only)

INFRA-DYNE
TRADE MARK

IMMEDIATE DELIVERY
(Wholesale Only)

All Parts for the Improved Infradyne

The New SARGENT-RAYMENT Circuit specifies CARDWELL NO. 317-C TRIPLE CONDENSER and GENERAL RADIO 368-A MIDGET CONDENSERS. You need these parts. Your customers will demand them.

Order Your Infradyne Parts from Us

Our stock of DRILLED and ENGRAVED PANELS, BASEBOARDS, in fact ALL PARTS required for the circuit is COMPLETE.

We are exclusive Northern California distributors for this OFFICIAL INFRADYNE MANUAL.

APEX SETS
Amsco
Acme Speakers
All-American "B" Bty. Eliminators
Aero Coils
Aero Loops
AmerTran
Amperites
"A1" Crystals
BALKITE
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Utah Cabinets
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United Radio Supplies Company

Northern California Distributors for the
"BREMER-TULLY COUNTERPHASE SETS" and the "APEX SIX"

693 MISSION STREET
SAN FRANCISCO

"Radio Exclusively"
(Wholesale Only)

Phones: Douglas 8357
Douglas 8358

TESTIMONIALS
from INFRADYNE OWNERS

HEARS AUSTRALIA

EDW. M. CORCORAN
RADIO
Sets and Parts
Artesia, Calif.

Sept. 22, 1926

RADIO,
San Francisco, Calif.,

Gentlemen:

It will probably be of interest to your subscribers to know that at four a. m. this morning I picked up Australia on the Infradyne described in your magazine.

I have built several sets described in your magazine since 1920 and have always found them to do all things that you claim and I cannot say this about any other.

Will say that Mr. Best and Mr. Sargent's articles are worth the price of the magazine.

Your well wisher since 1920,
(Signed) EDW. M. CORCORAN,

SEPARATES STATIONS 3 METERS APART

ELLIOT M. EPSTEEN
Attorney-at-Law
DeYoung Building, 690 Market St.,
San Francisco, Calif.

Sept. 27, 1926

Mr. H. W. Dickow,
Care Pacific Radio Pub. Co.
Pacific Bldg.,
San Francisco, Calif.
Dear Mr. Dickow:

I know you will be interested in learning some of the results had on my Infradyne last evening.

Station KPO, 428 meters, and Station CFCN at Calgary, 435 meters, both came in with great volume and though they are but 7 meters apart, I was able to completely blank out KPO although I am only one and a half miles from it in an air line.

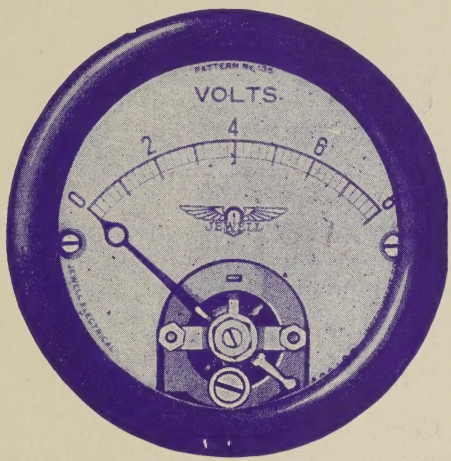
At the same time, I was able to separate KSL at Salt Lake City, 300 meters, from KTAB, 303 meters. In the latter case, the military band playing there last night came in like a local station as did KFI and KGW.

Later in the evening I brought in KFWC from San Bernardino with loud speaker volume, and this is but a 100 watt station.

The set is doing all that was claimed for it.

Cordially yours,
EME:AS (Signed) ELLIOT M. EPSTEEN,

JEWELL



PATTERN No. 135

Actual Size

A Quality Instrument

Infradyne Builders

Here is the radio instrument recommended for use with the new Infradyne receiver It is obtainable in any of the following ranges of which the **0-5 volt** has been particularly specified for the Infradyne.

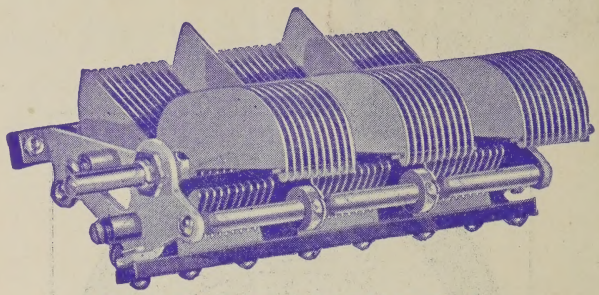
0-5, 0-8 or 0-10 Volts	$7.00
0-10, 15, 25, 50 or 100 Milliamperes	7.00

Send for New Radio Instrument Catalog No. 15-C

Jewell Electrical Instrument Co.

1650 Walnut Street, Chicago

"26 Years Making Good Instruments"



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LO LOSS

TRIPLE CONDENSER

Recommended
for the INFRA-DYNE Circuit

This Continental special triple condenser was designed for the INFRA-DYNE Circuit.

The low dielectric losses, exact capacities and mechanical perfection of these straight line wave length and frequency condensers make them the logical choice wherever fine reception is desired.

Licensed under Hogan Pat. No. 1014002
Capacity .00035---List Price
$9.50

GARDINER & HEPBURN, Inc.

611 Widener Building, Philadelphia

The Continental Single Condenser is also made in the following capacities: .00035, $2.50 list price; .00025, $2.50 list price; .0005, $2.50 list price, and Continental Junior Vernier Condenser listing at $1.25.

INFRA-DYNE